

CLAIMS

1. Method for manufacturing an actuation system for an optical component comprising:

- 5 - etching of a first face (51) of a component to form pads (14, 54, 154),
- etching of a second face (53) of the component to expose a flexible or deformable membrane (12, 52, 152) made of the same material as the pads,
- 10 - production of actuation means (16, 17, 30, 32, 56, 57) of the pads and membrane.

2. Method according to claim 1, the membrane and the pads having a total thickness less

15 than 30µm, or between 5 µm and 15 µm.

3. Method according to claim 1 or 2, the membrane having a thickness between 1 µm and 5 µm.

20 4. Method according to one of claims 1 to 3, the component being made from a semiconducting material or glass (51), and being provided with a surface layer (60) of semiconducting material or nitride in which the pads and membrane are etched.

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 5. Method according to one of claims 1 to 4, the component being of the SOI type comprising a surface layer of silicon (501), an insulating layer (502) and a substrate (503), the pads and the membrane

30 being made in the surface layer of silicon.

6. Method according to one of claims 1 to 3, the component being a silicon substrate covered by an insulating layer and a layer of polysilicon or a silicon substrate covered by a nitride layer, the pads and the membrane being made in the insulating or polysilicon or nitride layer respectively.

7. Method according to one of claims 1 to 3, the component being a silicon substrate doped on two sides (151, 153), the membrane and the pads being made in portions (152, 153) that are doped differently from each other.

8. Method according to one of claims 1 to 7, the actuation means being of the electrical or magnetic or thermal or piezo-electric type.

9. Method according to one of claims 1 to 7, the actuation means being of the electrical type and comprising one or several mobile electrodes (16, 56), connected to the pads of the device, and one or several fixed electrodes (17, 57).

10. Method according to one of claims 1 to 7, the actuation means being of the magnetic type and comprising one or several mobile coils (30) or magnets, connected to the pads of the device, and one or several fixed magnets (32) or coils.

11. Method according to one of claims 1 to 10, also comprising a step for making a first part (56) of the actuation means on the pads.

5 12. Method according to claim 11, also comprising an assembly step with a second substrate (58) on which a second part (57) of the actuation means is made, which cooperates with the first part to actuate the pads and the membrane.

10 13. Method according to one of claims 1 to 10, the actuation means (16, 17, 30, 32, 56, 57) being performed in an assembly step of the membrane and pads with a second substrate (58) on which these means were
15 previously formed.

 14. Method according to one of claims 1 to 13, the pads having a width or a width base less than 2 μm .

20 15. Method according to one of claims 1 to 14, the pads having a height / width ratio less than 20.

25 16. Method for making an optical component comprising production of an actuation system according to one of claims 1 to 15, and formation of reflecting means on the membrane.

30 17. Mechanical actuation system, for an optical component, comprising:

- a membrane (12, 52, 152) provided with pads (14, 54, 154) formed integrally with the membrane on one of its faces, the pads or the membrane being made:

- 5 • in a surface layer (60) made of semiconducting material or nitride, formed on a semiconducting material or glass (50),
- or in the silicon surface layer (501) of an SOI type component,
- 10 • or in a polysilicon or nitride surface layer deposited either directly on a substrate, or on an insulating layer itself deposited on a substrate,
- or in differently doped zones (152, 153) of a semiconducting substrate.
- 15 - actuation means (16, 17, 30, 32, 56, 57) of the pads and membrane.

18. System according to claim 17, the membrane and pads having a total thickness less than
20 30µm or between 5µm and 30µm.

19. System according to claim 17 or 18, the flexible membrane having a thickness between 1 µm and 5 µm.

25 20. System according to one of claims 17 to 19, the membrane being flexible.

21. System according to one of claims 17 to
30 20, the actuation means being of the electrical or magnetic or thermal type.

22. System according to one of claims 17 to
20, the actuation means being of the electrical type
and comprising one or several mobile electrodes (16,
56), connected to the pads of the device, and one or
5 several fixed electrodes (17, 57).

23. System according to one of claims 17 to
20, the actuation means being of the magnetic type and
comprising one or several mobile coils or magnets (30),
10 connected to the pads of the device, and one or several
fixed magnets or coils (32).

24. System according to one of claims 17 to
23, the pads having a width or width base less than 2
15 μm .

25. System according to one of claims 17 to
24, the pads having a height / width ratio less than
20.

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26. Optical component comprising an
actuation system according to one of claims 17 to 25,
and reflecting means on the membrane.